NETWORK INITIATED AUTO-REDIAL

BACKGROUND OF THE INVENTION

The invention is related to the art of telephone call redialing. The invention will be described in terms of mobile communications network initiated automatic redialing. However, the invention may be applied in other calling environments. For example, the invention may be applied to wired telephone networks.

5   When placing a telephone call, it is not uncommon to receive a busy signal or to be otherwise informed that the called party or user equipment of the called party is unavailable for completion of the call. In these situations, it is sometimes possible to leave a recorded message for the called party. However, in other situations, a message recording service or device is unavailable or inappropriate. In these situations, the calling party has few options

10   other than to try the call again at a later time.

Some user equipment and network features have been developed to make this task easier. For example, many phones include a redial button. The last number dialed is stored in a memory of the telephone. Pressing the redial button causes the last set of digits dialed to be automatically redialed. This feature allows the calling party to check periodically to see if

15   the called party or the user equipment of the called party is available to receive the call.

Some telephone networks can be configured to automatically redial the number of the called party and to alert the user equipment of the calling party when a connection to the called party is established.

However, these redialing solutions have drawbacks. Using the redial button requires

20   the calling party to interrupt other activities each time redialing is initiated. For example, if it is urgent that the calling party reach the called party, the calling party may be forced to redial every minute, thereby making it difficult to make another call or to carry out any other task. Currently available network based redial systems don't allow the calling party to set a duration for which redialing attempts are to be made, nor do they allow the calling party to

25   select a redial interval or frequency with which redial attempts are to be made. Furthermore, if the calling party is unavailable when the network establishes a connection to the called party, the called party hears only silence when answering the auto dial call and may be left with the impression that he or she is the victim of a prank or harassing phone call.

Therefore, there is a desire for a system and method of network initiated auto redialing that allows the calling party to select an appropriate redial interval and redial duration thereby reducing the chance that the call will be completed when the calling party is unavailable. Additionally, there is a desire for a system and method of network initiated auto

5　redialing that informs the called party of the purpose of the call should the call be completed when the calling party is unavailable.

SUMMARY OF THE INVENTION

A method for providing auto redial services to a calling party includes receiving a call

10　request from the calling party, extracting calling party and called party identifying information from the call request, attempting to terminate the call to the called party based on the extracted called party identifying information, determining that user equipment of the called party is unavailable, determining a retry duration selected by the calling party, releasing the user equipment of the calling party, starting a retry duration timer which will

15　expire when the selected retry duration has elapsed, reattempting to terminate the call to the called party until the call to the called party is successfully terminated or the retry duration timer expires, successfully terminating the call to the called party, and, attempting to alert the user equipment of the calling party.

The method can further include determining that the calling party is unavailable, and

20　sending an announcement message to the called party explaining that the call is an auto redial call and that the calling party is now unavailable.

Determining a retry duration selected by the calling party can include, for example, retrieving a pre-provisioned retry duration selected by the calling party from a subscriber database of the calling party, or, sending a message to the calling party requesting the retry

25　duration be entered through the use of the user equipment of the calling party and receiving the retry duration entry from the user equipment of the calling party.

Determining that the calling party is unavailable can include receiving a mobile busy response message from a cell site serving user equipment of the calling party. If the calling party subscribes to call waiting determining that the calling party is unavailable can include

30　playing a call waiting signal for the calling party, and determining that the calling party is not going to respond to the call waiting signal.

Reattempting to terminate the call to the called party can include determining a retry interval selected by the calling party and reattempting with a retry frequency based on the selected retry interval.

Determining the retry interval selected by the calling party can include, for example, retrieving a pre-provisioned retry interval selected by the calling party from a subscriber database of the calling party, or, sending a message to the calling party requesting the retry interval be entered through the use of the user equipment of the calling party, and, receiving the retry interval entry from the user equipment of the calling party.

Some embodiments include a method for providing auto redial services to a calling party using mobile user equipment. The method includes receiving, at an MSC, a origination message including calling party and called party identification information, receiving, at the MSC, an indication that user equipment of the called party is unavailable, transmitting, from the MSC, a message requesting an indication as to whether an auto redial service is desired, receiving, at the MSC, an indication that auto redial service is desired, transmitting, from the MSC, a message requesting a retry duration specified by the calling party, receiving, at the MSC, a calling party specified retry duration, releasing the user equipment of the calling party for other uses, reattempting repeatedly, for a period of time not to exceed the calling party specified retry duration, to terminate the call to the called party, attempting to alert the user equipment of the calling party if one of the reattempts is successful, and, terminating a call between the calling party and the called party if the attempt to alert the user equipment of the calling party is successful.

Some embodiments further include determining that the calling party is unavailable and sending an announcement message to the called party explaining that the call is an auto redial call and that the calling party is now unavailable.

Determining that the calling party is unavailable can include receiving, at the MSC, a mobile no page response message in regard to the user equipment of the calling party. Alternatively, determining that the calling party is unavailable can include receiving, at the MSC, a mobile busy response message from a cell site serving the user equipment of the calling party. Under those circumstances, in some embodiments, determining that the calling party is unavailable further includes playing a call waiting signal for the calling party, and determining that the calling party is not going to respond to the call waiting signal.

Reattempting to terminate the call to the called party can include receiving, at the MSC, a retry interval selected by the calling party, generating, within the MSC, a retry signal with a period associated with the selected retry interval, and sending, from the MSC, an IAM message each time the retry signal is generated.

For example, receiving, at the MSC, a calling party specified retry duration can include receiving, at the MSC, a pre-provisioned retry duration, selected by the calling party,

from a subscriber database associated with the calling party. Alternatively, or additionally, receiving, at the MSC, a calling party specified retry duration can include sending a message to the calling party requesting a retry duration be entered through the use of the user equipment of the calling party, and, receiving, at the MSC, the retry duration entry from the user equipment of the calling party.

Receiving, at the MSC, a retry interval selected by the calling party can include receiving, at the MSC, a pre-provisioned retry interval from a subscriber database of the calling party. Alternatively, receiving, at the MSC, a retry interval selected by the calling party can include sending a message to the calling party requesting a retry interval be entered through the use of the user equipment of the calling party, and, receiving the retry interval entry from the user equipment of the calling party.

A system for providing auto redial services to a calling party includes means for receiving a call request from the calling party, means for extracting calling party and called party identifying information from the call request, means for attempting to terminate the call to the called party based on the extracted called party identifying information, means for determining that user equipment of the called party is unavailable, means for determining a retry duration selected by the calling party, means for releasing the user equipment of the calling party, means for starting a retry duration timer which will expire when the selected retry duration has elapsed, means for reattempting to terminate the call to the called party until the call to the called party is successfully terminated or the retry duration timer expires, means for successfully terminating the call to the called party, and, means for attempting to alert the user equipment of the calling party.

Some embodiments also include means for determining that the calling party is unavailable, and means for sending an announcement message to the called party explaining that the call is an auto redial call and that the calling party is now unavailable.

The means for determining a retry duration selected by the calling party can include means for retrieving a pre-provisioned retry duration selected by the calling party from a subscriber database of the calling party. Alternatively, or additionally, the means for determining the retry duration selected by the calling party can include means for sending a message to the calling party requesting the retry duration be entered through the use of the user equipment of the calling party, and, means for receiving the retry duration entry from the user equipment of the calling party.

The means for determining that the calling party is unavailable can include means for receiving a mobile busy response message from a cell site serving user equipment of the

calling party. Additionally, the means for determining that the calling party is unavailable can include means for playing a call waiting signal for the calling party, and, and means for determining that the calling party is not going to respond to the call waiting signal.

The means for reattempting to terminate the call to the called party can include means for determining a retry interval selected by the calling party, and, means for reattempting with a retry frequency based on the selected retry interval.

The means for determining the retry interval selected by the calling party can include means for retrieving a pre-provisioned retry interval selected by the calling party from a subscriber database of the calling party. Alternatively, or additionally, the means for determining the retry interval selected by the calling party can include means for sending a message to the calling party requesting the retry interval be entered through the use of the user equipment of the calling party, and, means for receiving the retry interval entry from the user equipment of the calling party.

DESCRIPTION OF THE DRAWINGS

The invention may take form in various components and arrangements of components, and/or in various procedures and arrangements of procedures. The drawings are only for purposes of illustrating preferred embodiments, they are not to scale and are not to be construed as limiting the invention.

FIG. 1 and FIG. 2 are first and second parts of a flow chart summarizing a method for providing auto redial services to a calling party.

FIG. 3 is a call flow diagram summarizing the operation of a system for performing the method of FIG. 1 under a first call scenario.

FIG. 4 is a call flow diagram summarizing the operation of the system for performing the method of FIG. 1 under a second call scenario.

FIG. 5 is a call flow diagram summarizing the operation of the system for performing the method of FIG. 1 under a third call scenario.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1 and FIG. 2, a method **110** for network initiated auto redialing may begin when a call request is received **114** (for example, at Switching Center) and called and calling party identification information is extracted **118** from the received **114** call request. The called party identification information is used in a determination **122** as to whether user equipment of the called party is available for completing the call.

If the user equipment of the called party is available, there is no need for auto redialing and the call is processed **126** without auto redialing. However, if the user equipment of the called party is unavailable, for instance, because the user equipment is currently offline or shut off or because the user equipment is currently in use (busy), then a determination **130** may be made as to whether or not the calling party subscribes to an auto redial feature. For example, the Switching Center may make the determination 130 by accessing a subscriber database associated with the calling party. If the calling party does not subscribe to auto redialing, then the call is processed without auto redialing **126**. For example, the calling party is played a busy signal. Of course, if auto redialing is a standard feature available to all calling parties then the determination **130** may be skipped.

If the calling party does subscribe to an auto redial service or such a service is available to all calling parties then a determination **134** is made as to whether the calling party wishes to use the auto redial feature in the present call. If the calling party does not wish to use auto redialing in the present call then the call is processed without auto redialing. For example, a busy signal is played **138** for the calling party or the call is ended, thereby releasing the user equipment of the calling party for use in another task. If the calling party does wish to use auto redialing in the current call then an auto redial duration is requested **142**. For instance, a subscriber database may be accessed (for example my the Switching Center) to determine a redial duration selected by the calling party. Alternatively, an announcement or menu selection message is sent to the user equipment of the calling party and the calling party enters a redial duration through a numeric keypad, voice recognition or other means. For example, the calling party may want the network to attempt to complete the requested call for the next hour or for only the next fifteen minutes. For instance, the calling party may know that he or she will be unavailable to complete the call after a period of fifteen minutes. Therefore, the calling party enters or selects the fifteen minute retry duration.

A retry interval may also be requested **146**. For example, a predefined retry interval selected by the calling party may be requested from a subscriber database. Alternatively, an announcement or retry interval selection menu may be presented to the calling party. For instance, a charge may accrue for each retry attempt. Therefore, the calling party may decide that retrying or redialing once every ten minutes is sufficient. On the other hand, if the call is very urgent, the calling party may determine that the call should be redialed every ten seconds. Once a calling party selected retry interval is received, the user equipment of the calling party is released **214** for other uses. For example, the calling party may hang up. Alternatively, the network may issue a disconnect command or message.

Redial duration and redial interval timers are started **218** (for example, the timers are implemented within the Switching Center) and the network redials or retries **222** to establish a connection with the user equipment of the called party. A determination **226** is made as to whether the user equipment of the called party is available to complete the call. If **226**, the user equipment of the called party is available, the user equipment of the called party is alerted and a determination **230** is made as to whether the user equipment of the calling party is reachable. If the user equipment of the calling party is not reachable, because, for example, the calling party is no longer connected to the network, because, for example, the calling party is out of range of a network cell site or because user equipment of the calling party has been turned off, then when the user equipment of the called party goes off hook in response to the alert, an explanatory message is played **234** to the called party. For example, the message explains that the call is an auto redial call and that the calling party is no longer available. Additionally, the message may include a directory number of the calling party and/or a name or other identification of the calling party.

If **230**, the user equipment of the calling party is reachable, a determination **238** is made as to whether the user equipment of the calling party is busy. If the user equipment of the calling party is not busy, the user equipment of the calling party is alerted **240** and the call is completed **242** or terminated between the calling and called parties. If **238**, the user equipment of the calling party is busy, a determination **246** is made as to whether the calling party subscribes to a call waiting feature. If **246**, the calling party does not subscribe to a call waiting feature, a message is played **234** to the called party if and when the user equipment of the called party goes off hook. As explained above, the message explains that the call is an auto redial call and that the calling party is no longer available. If **246** the calling party does subscribe to call waiting, a call waiting tone is played **250** for the calling party. If the calling party responds to the call waiting tone and answers the call, the call is completed **242** as described above. If after a reasonable period of time it is determined **254** that the calling party is not going to respond or has not responded to the call waiting tone, the explanatory message **234** is played to the called party.

If **226**, the user equipment of the called party is not available, a determination **258** is made as to whether the redial interval has expired. When **258**, the redial interval has expired, a determination **266** is made as to whether the redial duration has expired. If the redial duration has not expired, the call is redialed **222**, the redial interval timer is restarted and the determination **226** as to whether the user equipment of the called party is available is made once again. If the redial duration has expired, redialing stops **268**.

For example, referring to FIG. 3, a calling party uses a mobile phone **310** to place a call to a called party (not shown). The mobile phone **310** generates a mobile origination message **314**, which is transmitted to a cell site **318** serving the mobile phone **310**. The cell site **318** transmits a related origination message **322** to a Mobile Switching Center (MSC)

5   **326**. The Mobile Switching Center receives **114**, the origination message **322** as a call request. The MSC **326** extracts **118** called party identification information from the origination message **322** and attempts to determine **122**, whether the user equipment of the called party is available for completing the requested call by transmitting, for example, an initial address message (IAM) **330** over a network **334** connecting the MSC **326** to the user

10   equipment of the called party. In this scenario, the network **334** responds with an address complete message (ACM) **338** including a parameter value, in for example, a cause indicator field, indicating that the user equipment of the called party is currently in use or busy. The MSC **326** receives this indication that the user equipment of the called party is busy and thereby completes the determination **122**, that the user equipment of the called party is not

15   available. Therefore, the MSC **326** attempts to determine **130** whether the calling party subscribes to an auto redial service.

For instance, the MSC **326** queries **342** a subscriber database located, for example, in a Home Location Register (HLR) **344**. The subscriber database transmits a query response message **346** to the MSC **326** indicating that the calling party does subscribe to an auto redial

20   feature. Therefore, the MSC **326** attempts to determine **134**, whether the calling party wishes to use auto redialing in the current call. The MSC **326** transmits a query to the cell site **318** in the form of an MSC to Cell Site request message **348**. The cell site **318** relays the query to the mobile station **310** in the form of a Cell Site to Mobile Station request message **350**. The queries of **348**, **350** may be in the form of synthesized or recorded voice messages or text

25   messages to be played or displayed on the user equipment of the calling party (e.g. **310**). The queries **348**, **350** may simply ask if auto redial is to be used or they may additionally ask for a redial duration **142** and/or a redial interval **146**. Alternatively, the user selected redial duration and/or interval may be requested **142**, **146** and received from the subscriber database in the query response message **346** or as a response to a second subscriber database query

30   (not shown). For example, the MSC **326** may send a second subscriber database query instead of or in addition to the query messages **348**, **350** described above.

In this first scenario, the calling party responds to the query message **350** by indicating that auto redialing is desired and by entering or selecting a redial duration time. The mobile phone **310** accepts these entries and includes them as an activation **352** and time

354 parameter in a Mobile Station to Cell Site response message **356**, which is transmitted to the Cell Site **318**. The Cell Site **318** includes the parameters **352, 354** in a Cell Site to MSC response message **358**, which is sent or transmitted to the Mobile Switching Center **326**. Having thus determined **134**, if the calling party wishes to use the auto redialing feature, the Mobile Switching Center starts **218** redial interval and duration timers. For instance, a redial interval preselected by the calling party may have been included in the query response message **346** or may have been included as a response to a database query (not shown). Alternatively, a redial interval may have been specified as a response to the query messages **348, 350** as an additional parameter in the response messages **356** and **358**.

The MSC **326** initiates auto redialing by retrying or redialing the call **222**. Retrying or redialing **222** may begin immediately or upon the first expiration **258** of the retry or redial interval timer. With each retry **222** the MSC **326** sends or transmits an IAM message **360**. The network **334** responds to each IAM message with an Address Complete Message (not shown) indicating that the user equipment is unavailable or busy, until of course, a connection is completed. At that point, the network **334** responds with an Answer Message (ANM) **364**.

After responding **356** to the request message **350**, the calling party or the MSC may end the current call. For example, the mobile user hangs up and the mobile phone **310** sends a mobile unit release message **368** to the cell site **318**. The mobile unit release message **368** is relayed to the Mobile Switching Center **326**.

If and when the Mobile Switching Center receives the ANM message **364** indicating that a connection has been established between the MSC **326** and the called party or the user equipment of the called party, the MSC **326** attempts to reestablish a connection to the user equipment of the calling party or mobile **310** by sending an MSC_Page_Request message **372** to the cell site **318** or other appropriate cell site. The cell site **318** responds with a Mobile Busy message **378** to the MSC **326**, thereby allowing the MSC to determine **230** that the user equipment of the calling party is reachable and to determine **238** that the user equipment of the calling party is busy. Therefore, the MSC **326** sends a query **382** to the Home Location Register **344** of the calling party to determine **246** if the calling party subscribes to a call waiting feature. In the illustrated scenario, the HLR **344** transmits a response message **384** to the MSC **326** indicating that the calling party does not subscribe to call waiting. Therefore, the MSC **326** transmits an Announcement Request message (ANCREQ) **388** to the network **334**, directing the network to play or send **234** an explanatory message to the called party. For instance, the message indicates that the call is an auto redial

call but that the calling party is no longer available. The message may further indicate an identity of the calling party and/or a directory number of the calling party.

Referring to FIG. 4, in a second scenario, a second calling party uses a second mobile phone or user equipment **410** to place a call. As described in reference to FIG. 3, the call

5 generates a mobile origination message **314**, an origination message **322**, and an IAM message **330** transmitted or sent from the mobile calling party user equipment **410** to the cell site **318**, from the cell site **318** to the MSC **326** and from the MSC **326** to the network **334** respectively. The network **334** responds with an ACM message **338** indicating that the called party or the user equipment of the called party is busy. Again the MSC queries **342**, a

10 subscriber database, to determine **130** if the calling party subscribes to an auto redial feature. The subscriber database responds **346** with an indication that the calling party does subscribe to auto redial. The MSC requests **142** an auto redial duration with an MSC to Cell Site request message **348**. Alternatively, the MSC **326** might make the request of the subscriber database. Again the cell site **318** relays the request message **348** from the MSC **326** in the

15 Cell Site to Mobile Station request message **350**. The calling party responds either by voice or keyboard entry with an auto redial activation command and an auto redial duration. The user equipment of the calling party **410** generates the Mobile Station to Cell Site response message **356** including parameters indicating auto redial activation **352** and a redial duration time **354**. The request **348, 350** may have also requested a retry interval selection. In that

20 case, the mobile station to cell site response message **356** would include an interval parameter as well. Alternatively, the information may be collected in a series of requests and responses.

Again, the cell site **318** generates and transmits or sends a Cell Site to MSC response message including the parameters (e.g. **352, 354**). Once again, the MSC begins redialing or retrying **222** by transmitting or sending a series of IAM messages **360**. The frequency of the

25 IAM message transmission is determined by the selected or entered interval time. The retries continue for a duration not to exceed the redial duration time **354**. Having received all the needed information, the MSC **326** or the calling party **410** may end the current call. For example, the mobile user hangs up and the mobile phone **410** sends a mobile unit release message **368** to the cell site **318**. The mobile unit release message **368** is relayed to the

30 mobile switching center **326**.

If and when the network sends or transmits an ANM message **364** to the MSC, indicating a connection to the called party has been established, the MSC **326** sends or transmits an MSC_Page_Request message **372** to the appropriate cell site (e.g. **318**).

Again, the mobile **410** is being used for another call and the cell site again sends the mobile busy message **378** to the MSC **326** indicating to the MSC **326** that the user equipment of the calling party is reachable **230** but is busy **238**. Therefore, once again, the MSC **326** sends a query **382** to the subscriber database in order to determine if the calling party

5   subscribes to call waiting.

In this scenario, the subscriber database sends or transmits a query response message **486** indicating that the calling party does subscribe to call waiting. Therefore, the MSC **326** sends a call waiting message **486** to the serving cell site (e.g. **318**). The cell site sends or plays **250, 488** the call waiting tone to the mobile user equipment **410**. The calling party

10   answers the call waiting tone and the mobile user equipment **410** transmits a connect message **490** to the cell site. In turn, the cell site sends an answer message **492** to the MSC **326**. This allows the MSC **326** to determine **252** that the calling party has answered. Therefore, the MSC **326** completes the call **242** by transmitting a connect message **494** to the network **334**.

Referring to FIG. 5, in a third scenario a third calling party places a call using a third

15   mobile device such as a mobile phone **510**. Call processing proceeds in a manner similar to that described in reference to FIG. 3, up until the point that the MSC **326** and cell site **318** send or transmit respective pages **372, 374**. In third scenario, the third mobile device **510** responds to the page **374** from the cell site **318** by transmitting a page response **514** to the cell site **318** and then the mobile device **510** rings or vibrates, etc. (alerts **240**). The cell site **318**

20   relays the page response **514** to the mobile switching center **326**. The MSC **326** responds by orchestrating call set up procedures between the mobile **510** and the called party via the network **334** as is known in the art. At the end of call set up, the mobile transmits a connect message **518** to the cell site **318**. The cell site **318** transmits an answer message **522** to the MSC **326** which in turn transmits a connect message **526** to the user equipment of the called

25   party via the network **334**, thereby completing the call **242**.

The invention has been described with reference to preferred embodiments. Obviously, modifications and alterations will occur to others upon reading and understanding the present specification. For example, in the described embodiments most of the functions of the method **110** for network initiated auto redialing are orchestrated or performed by

30   hardware and software included in a Switching Center, such as the Mobile Switching Center **326**. It is to be understood that other embodiments may distribute the functions of the method **110** throughout a network or within other devices. The invention may be implemented in wired networks as well as, as described above, within mobile networks. It is

intended that the invention be construed as including all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.